Integrated Concurrent Engineering (ICE): Building Lean Conceptual Design Factories

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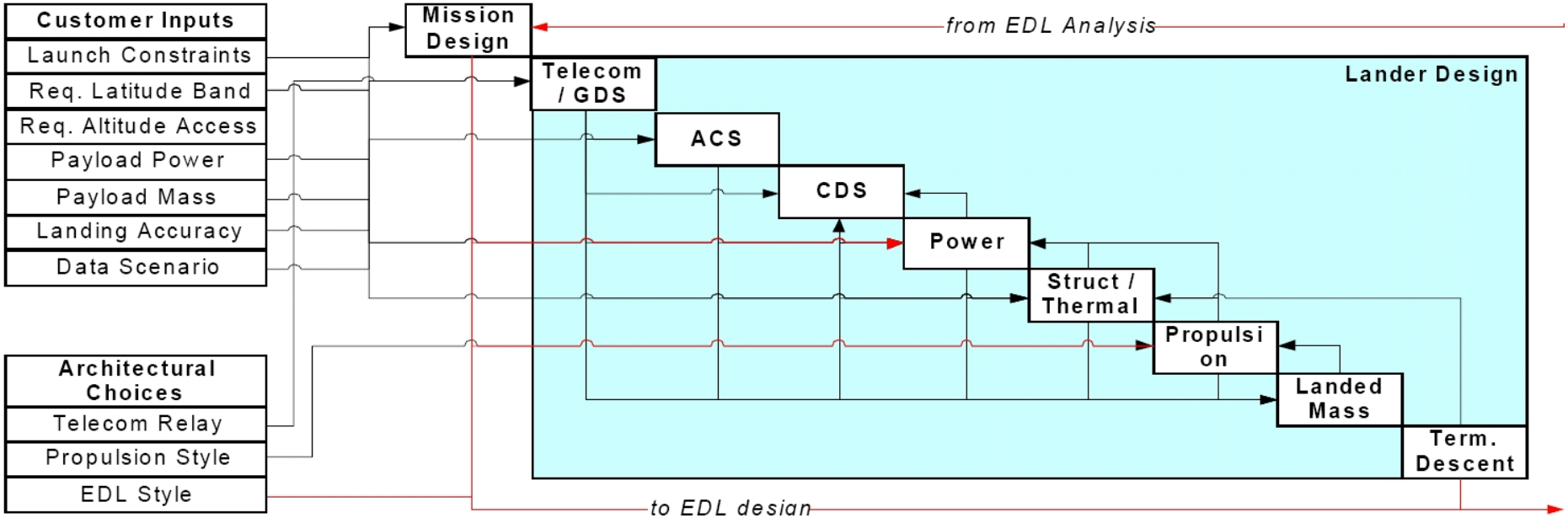
The ICE Approach

(Mark, 2002)

Results of the ICE Approach

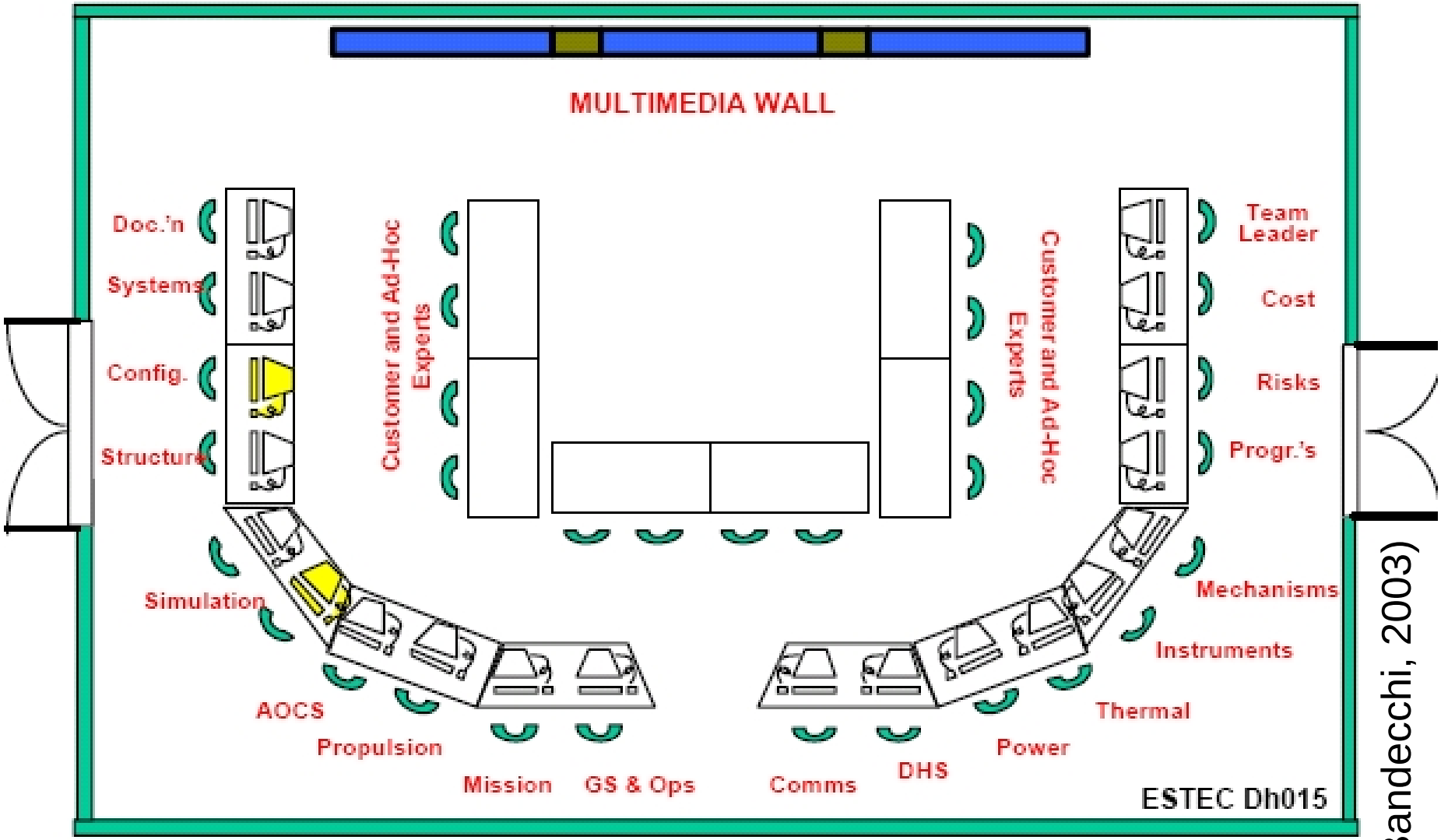
- **Cost** reductions (> 3×) in individual concept design studies
- **Schedule** reductions (> 10×) in individual concept design studies
- **Volume** increases (> 5×) in number of studies over a given period
- **Quality** cost estimates (± 5-10%) versus state-of-the-art

Standardizing Design Relationships



(Lamassoure, 2004)

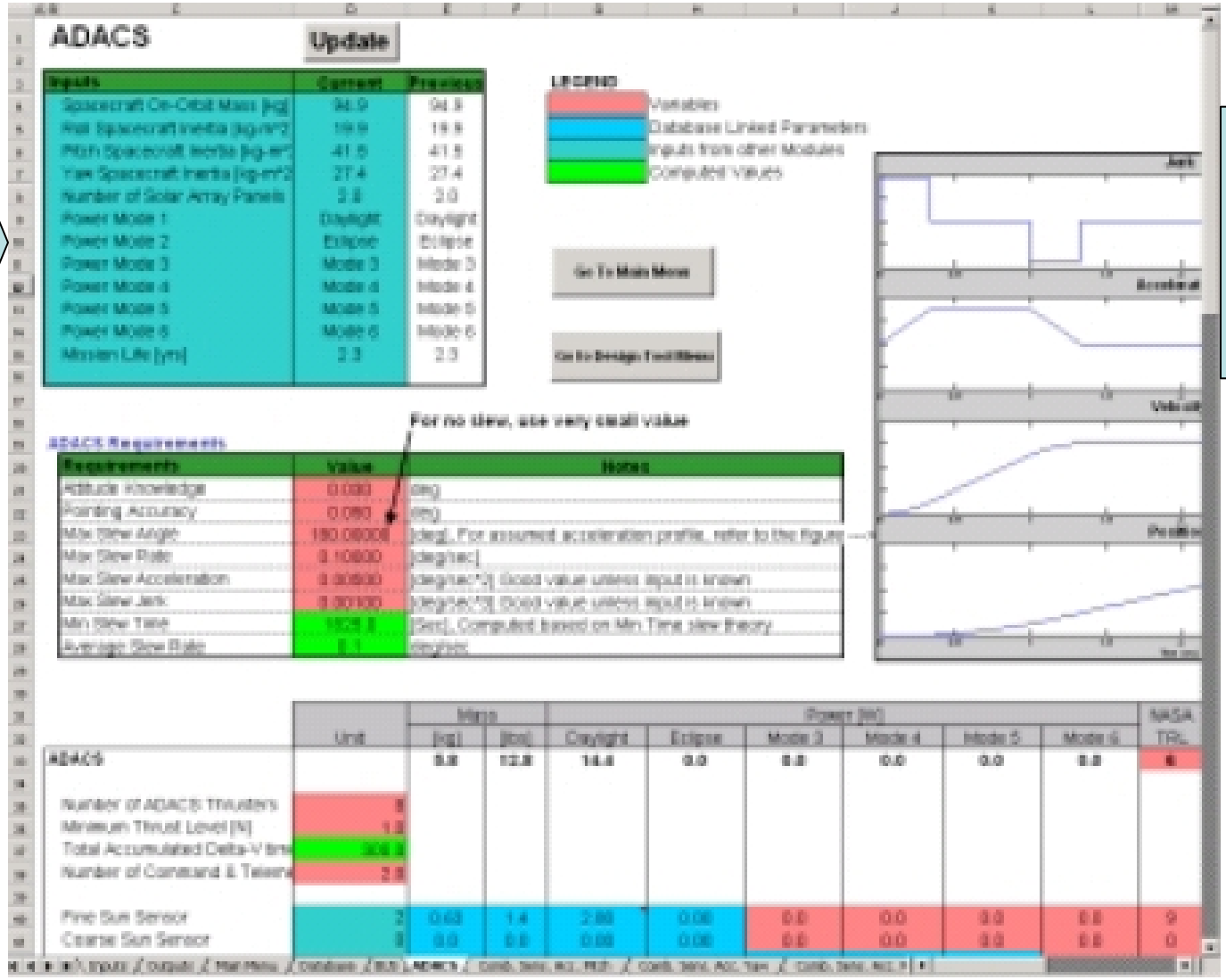
Building a Process Environment



(Bandecchi, 2003)

Building Standardized Yet Flexible Tools

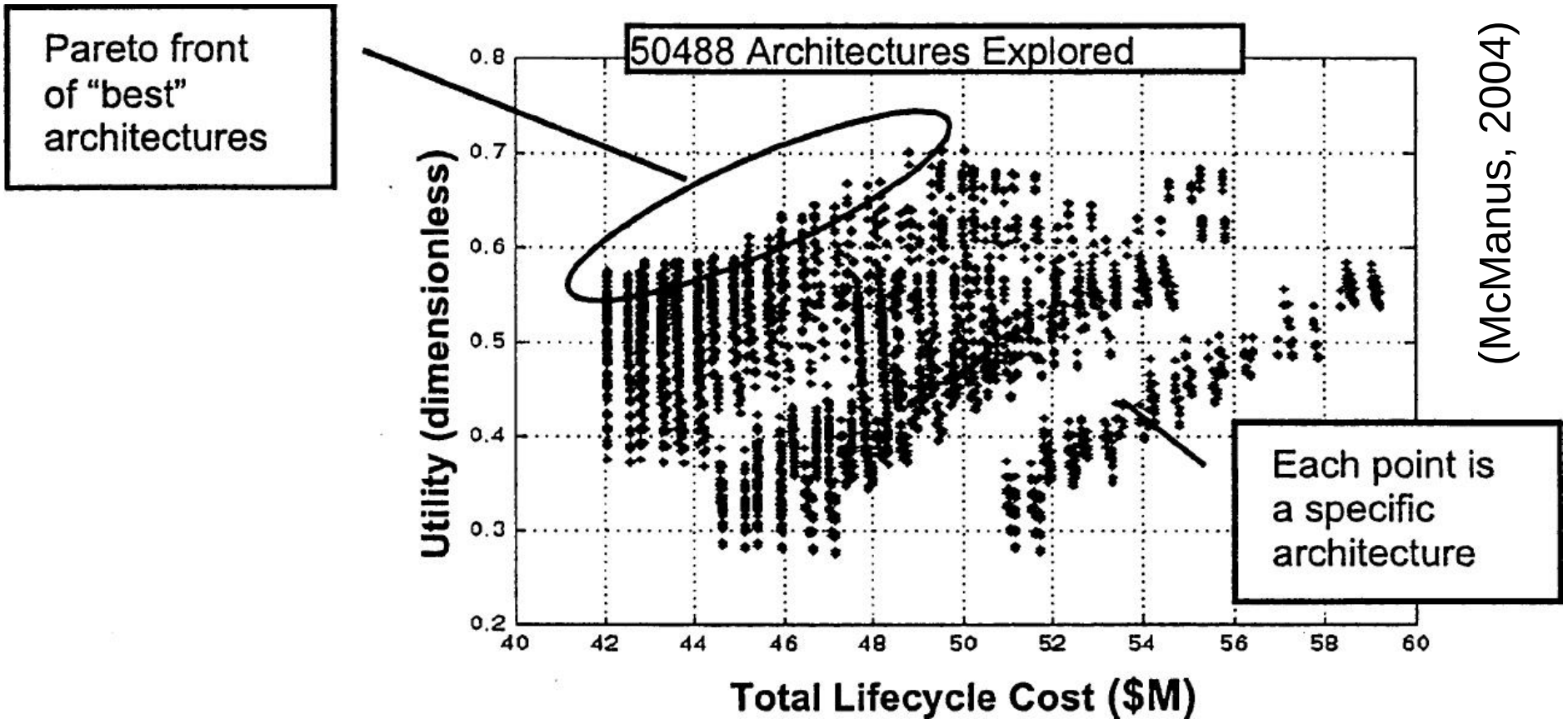
Inputs



Outputs

(McInnes, 2003)

The Role of the Customer



(McManus, 2004)

How Far Can We Go with ICE?

- **Flexibility/Reconfigurability:** functional decomposition and manipulation of design models
- **High- & Low-Level Integration:** end-to-end models for simultaneous conceptual and detailed design
- **Solution Space Search:** practical reuse of design solutions from prior internal or public projects
- **Simulated Collocation:** distributed collaborative design with low communication barriers
- **Organizational Integration:** universal process adoption and training within the enterprise

In information production, there is no limit to how far we can go …